CORRELATION BETWEEN FOOD QUALITY AND PRESERVATION METHODS

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Abstract:
The food quality depends not only on raw materials, production process, personnel qualification etc. but also on preservation methods used to maintain initial level of physicochemical and sensory characteristics after the product is obtained. In order to emphasize the correlation between food quality and preservation methods, a study was conducted on white wine. The wine samples were storaged according to its period of validity on two different preservation conditions in which the air temperature was the only variable of preservation parameters. The study showed that both levels of preservation temperatures have influenced the wine quality, but in different proportions.

Key words: food quality, preservation, physicochemical characteristics, sensory characteristics

JEL classification: L15, L66

1. INTRODUCTION

Most foods are obtained in different locations around the word and are consumed elsewhere due to the specific conditions of production and raw materials, foods demand etc. So, between production and consumption are some important processes such as re-packaging, preservation, shipping, handling etc.

Every process influences the food quality in a positive or negative way. The positive way refers to maintain the initial level of food quality until it will be consumed by the people. The negative way implies that one or more processes reduce the level of food quality with different proportions.

The food preservation must ensure that the level of storage parameters such as air temperature, airflow, relative air humidity, air chemical composition, solar radiation, biological factors etc. is in accordance with food requirements and kept under control.

The importance of food preservation equals the chemical composition because it has the power to transform a safe product in unsafe one. For example, a food that is sell to distribution agents by the producer and is under the safety regulations can disobey the quality standards if the distribution companies will storage it on preservation parameters which are different from the one specified in the certification of conformity.

For any food production or distribution company which has the quality management system implemented and certified in conformity with SR EN ISO 9001: 2008 and/or SR EN ISO 22000: 2005, the product preservation is a important stage along with reception, production, control etc. to ensure the food innocuity [9].

Although it is the penultimate stage before the shipping, the preservation must be approached as a system, with inputs represented by tested products, outputs as products that will be shipped and some internal and external factors that can have negative influence on product quality.

This system approach of food preservation, which is proper to quality management systems, has advantages, on the one hand, for production or distribution companies because it allows them to identify all the factors which interfere in preserving and to previously conceive and plan the preventive and corrective actions according to the changes of product quality. On the other hand, it contributes to ensure the consumer protection by purchasing only safe products, which don't have sensory, physicochemical or microbiological changes that can threat their health or life.

2. CORRELATION BETWEEN WINE QUALITY AND PRESERVATION METHODS

To highlight the importance of food preservation, a research was carried out on white wine. It was chosen the medium dry Sauvignon Blanc wine. It is a DOC superior quality wine with CMD. The sample was obtained by crushing the grapes from Dealu Mare vineyard (Prahova country) [6].

The study consisted in preserving the wine in two different storage conditions:

a) Air temperature 15^{o}C, relative air humidity 75% and preservation period 60 days, which are the regular preservation conditions for white wines.

b) Air temperature 20^{o}C, relative air humidity 75% and preservation period 60 days, which are the ordinary preservation conditions for white wines.

The difference between the two above storage conditions is represented only by the level of air temperature because is one of the most important variables of preservation conditions.

Throughout the study, firstly, four physicochemical analyses have been conducted and secondly, four sensory analyses at 0 (bottle day), 30, 45 and 60 days from the production date of wine.

The physicochemical and sensory characteristics analyzed are presented in figure 1.

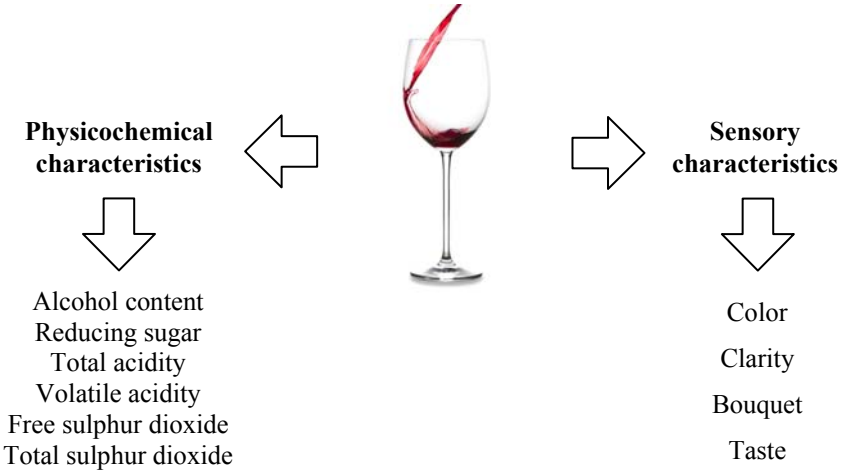

Figure 1. The physicochemical and sensory characteristics analyzed in the study
Source: Made by author

The figure 1 shows that ten wine characteristics were analyzed which six are physicochemical characteristics and four sensory characteristics.

The six physicochemical characteristics of wine which were selected for this analysis are the ones mentioned in standards for wine testing. In the same way, the color, clarity, bouquet and taste are the main sensory characteristics tested by sensory experts in the international wine competitions.

The preservation methods influence both the physicochemical and sensory characteristics of wine in different ways.

2.1. CORRELATION BETWEEN PHYSICOCHEMICAL CHARACTERISTICS AND PRESERVATION METHODS

The two preservation temperatures had particular effects on each physicochemical characteristic of Sauvignon Blanc wine.

Figures 2-7 show the evolution of physicochemical characteristics level of Sauvignon Blanc wine preserved at 15^{o}C (continuous line) and 20^{o}C (broken line).

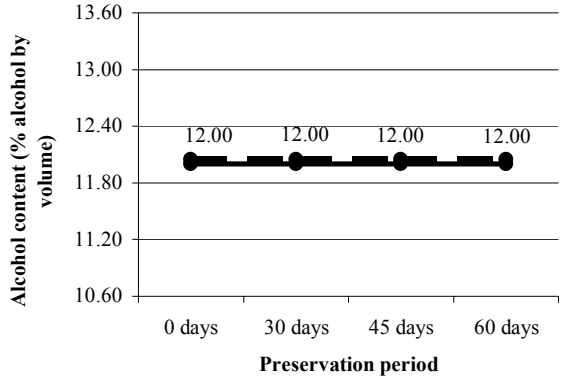

Figure 2. Evolution of alcohol content level of Sauvignon Blanc wine preserved at 15°C and 20°C

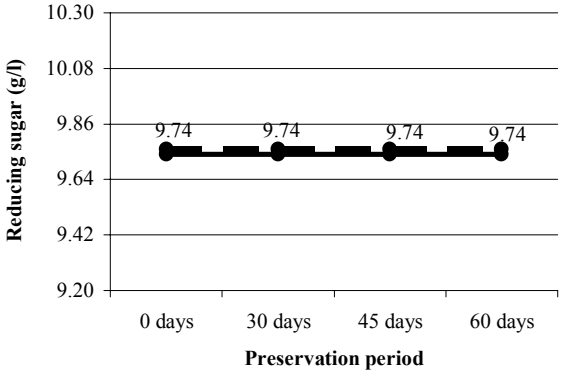

Figure 3. Evolution of reducing sugar level of Sauvignon Blanc wine preserved at 15°C and 20°C

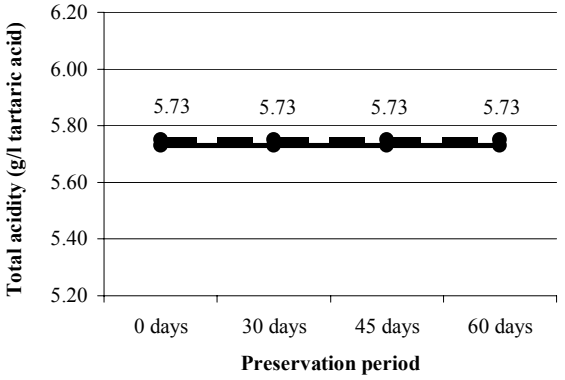

Figure 4. Evolution of total acidity level of Sauvignon Blanc wine preserved at 15°C and 20°C

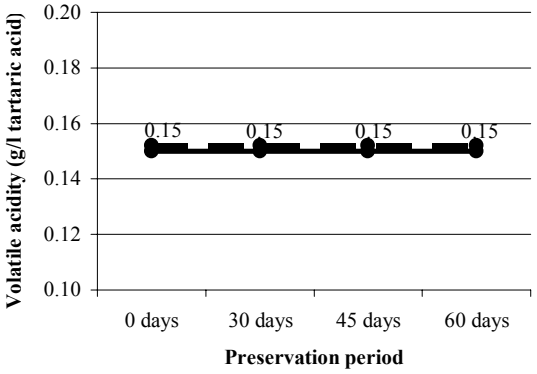

Figure 5. Evolution of volatile acidity level of Sauvignon Blanc wine preserved at 15°C and 20°C

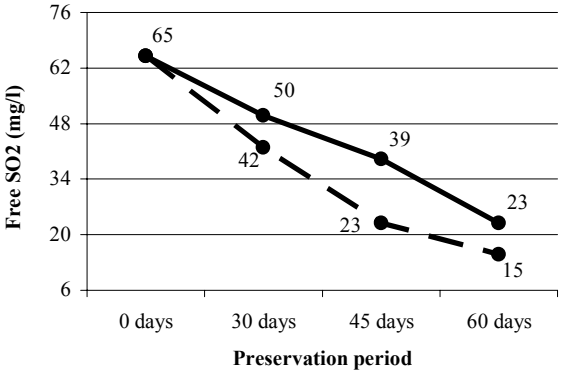

Figure 6. Evolution of free SO_2 level of Sauvignon Blanc wine preserved at 15°C and 20°C

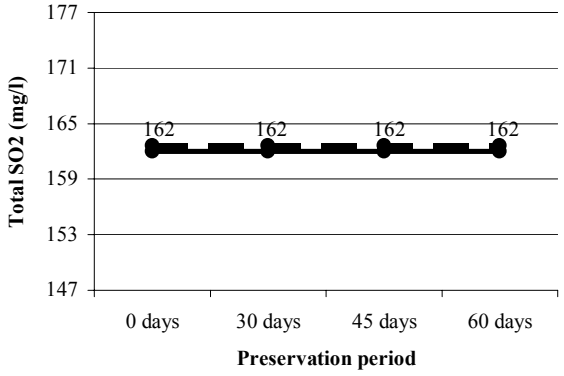

Figure 7. Evolution of total SO_2 level of Sauvignon Blanc wine preserved at 15°C and 20°C

Source: Data from own analysis

Figures 2-7 show that during the 60 day preservation period, both air temperatures 15°C and 20°C had no influence on level of alcohol content, reducing sugar, total acidity, volatile acidity and total sulphur dioxide. Only one physicochemical characteristic had changes of its level, i.e. free sulphur dioxide.

The sulphur dioxide content of wines comes both from the natural fermentation of must and most is added in the winemaking. It has anti-microbial properties against bad yeast and bacterial growth and anti-oxidant action besides browning process, which ensure the wine preservations [1].

Even the free sulphur dioxide level decreased, Sauvignon Blanc wine has higher chemical stability (than superior wines for example) due to the fact that it is a DOC (Controlled Designation of Origin) wine.

The chemical stability of wine is directly proportional with the alcohol content and acidity which have antiseptic proprieties, also. Thus, the wines can be preserved for extended periods of time without being sensitive to harmful microorganisms. In some cases, ethanol (ethyl alcohol) is being added in the wine during the winemaking in order to increase the chemical stability of wine [3, 8].

In table 1 were computed the absolute and relative changes of physicochemical characteristics (free sulphur dioxide) level of Sauvignon Blanc wine preserved at 20°C beside 15°C, in order to emphasize the scale of changes.

Table 1. Absolute and relative changes of physicochemical characteristics level of Sauvignon Blanc wine preserved at 20°C beside 15°C

No.	Physicochemical characteristics	Preservation period							
		0 days		30 days		45 days		60 days	
		sum*	%	sum	%	sum	%	sum	%
1.	**Alcohol content**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
2.	**Reducing sugar**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
3.	**Total acidity**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
4.	**Volatile acidity**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
5.	**Free SO_2**	**-**	**-**	**-8**	**-16**	**-16**	**-41.02**	**-8**	**-34.78**
6.	**Total SO_2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

* **s**pecific **u**nit of **m**easure (see figures 2-7)

Source: Own calculation based on data from figures 2-7

Table 1 shows that the free sulphur dioxide level of wine preserved at 20°C beside 15°C decreased with 16% in the 30th day preservation, with 41.02% in the 45th day preservation and with 34.78% in the 60th day preservation.

The evolution of changes in the free sulphur dioxide level of Sauvignon Blanc wine preserved at 20°C beside 15°C is shown in figure 8.

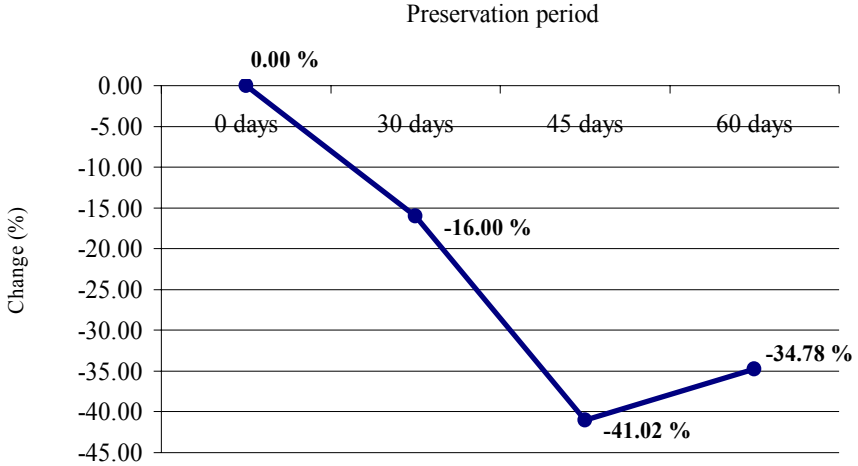

Figure 8. Evolution of changes in the free sulphur dioxide level of Sauvignon Blanc wine preserved at 20°C beside 15°C

Source: Own calculation based on data from figures 2-7

In figure 8 is shown that at 20°C beside 15°C the free sulphur dioxide level had registered only decreases which took place after the second half of preservation period.

The biggest decline of free sulphur dioxide level was in the 45th day preservation (41.02%) and the smallest in 30th day preservation (16%). This means that even the difference between the two storage temperatures was constant the free sulphur dioxide level had not the same trend.

2.2. CORRELATION BETWEEN SENSORY CHARACTERISTICS AND PRESERVATION METHODS

If, in the case of testing the physicochemical characteristics the laboratory equipments were used, for sensory characteristics the wine sensory experts assessed each sample on the four moments of period of validity.

The evolution of sensory characteristics level of Sauvignon Blanc wine preserved at 15°C (continuous line) and 20°C (broken line) are shown in figures 9-12.

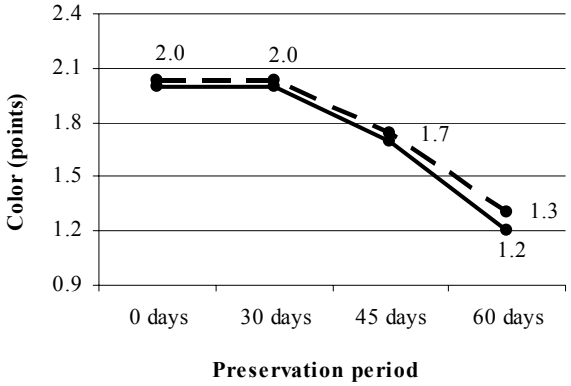

Figure 9. Evolution of color level of Sauvignon Blanc wine preserved at 15°C and 20°C

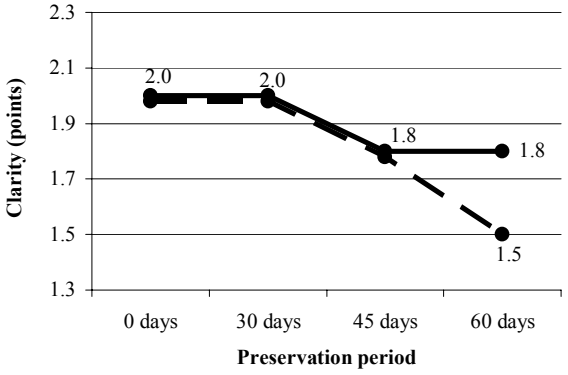

Figure 10. Evolution of clarity level of Sauvignon Blanc wine preserved at 15°C and 20°C

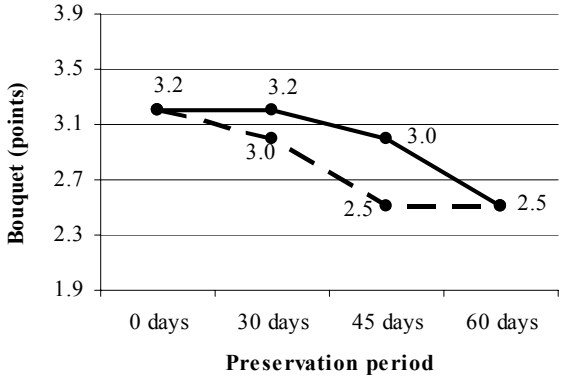

Figure 11. Evolution of bouquet level of Sauvignon Blanc wine preserved at 15°C and 20°C

Source: Data from own analysis

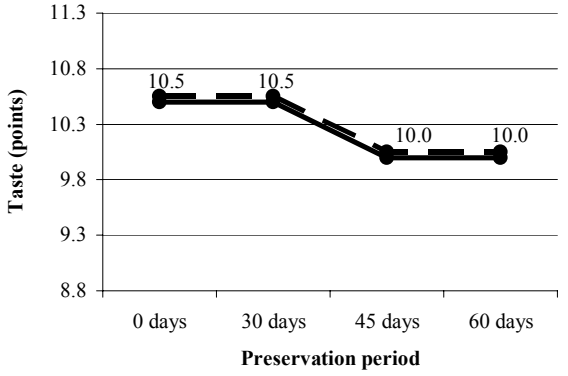

Figure 12. Evolution of taste level of Sauvignon Blanc wine preserved at 15°C and 20°C

Figures 9-12 illustrate that the two different preservation temperatures generated changes in the level of all four sensory characteristics of Sauvignon Blanc wine.

Each sensory characteristic had its own trend. The color, clarity and taste level has been the same at both 15°C and 20°C storage temperature from the bottle day until 45th day preservation.

The absolute and relative changes of sensory characteristics level of Sauvignon Blanc wine preserved at 20°C beside 15°C are presented in table 2.

Table 2. Absolute and relative changes of sensory characteristics level of Sauvignon Blanc wine preserved at 20°C beside 15°C

No.	Sensory characteristics	Preservation period							
		0 days		30 days		45 days		60 days	
		points	%	points	%	points	%	points	%
1.	**Color**	**-**	**-**	**-**	**-**	**-**	**-**	**+0.1**	**+8.33**
2.	**Clarity**	**-**	**-**	**-**	**-**	**-**	**-**	**-0.3**	**-16.66**
3.	**Bouquet**	**-**	**-**	**-0.2**	**-6.25**	**-0.5**	**-16.66**	**-**	**-**
4.	**Taste**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Source: Own calculation based on data from figures 9-12

Table 2 shows that the color and clarity level of wine preserved at 20°C beside 15°C changed only in the 60th day preservation, i.e. the color level increased with 8.33% and the clarity level decreased with 16.66%.

As well, the bouquet level declined in the 30th day preservation with 6.25% and in the 45th day preservation with 16.66%. In stead, the taste level of wine had similar evolution in the two preservation temperatures.

The figure 13 highlights the evolution of changes in the sensory characteristics level of Sauvignon Blanc wine preserved at 20°C beside 15°C.

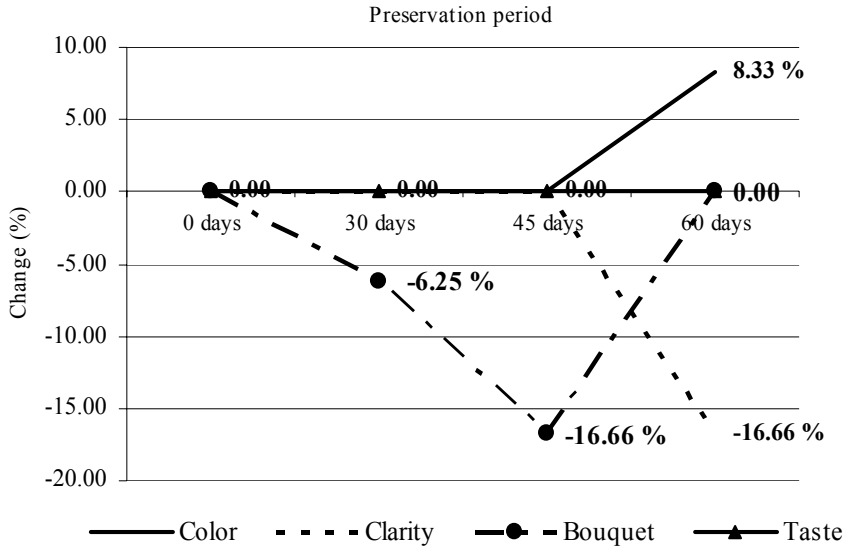

Figure 13. Evolution of changes in the sensory characteristics level of Sauvignon Blanc wine preserved at 20°C beside 15°C

Source: Own calculation based on data from figures 9-12

In figure 13 is shown that all sensory characteristics had specific changes at 20°C beside 15°C. The clarity and bouquet level of wine had reductions and the color level of wine increased. As well, the color and clarity levels of wine had contrary evolutions which came out at the end of regular preservation period, i.e. in the 60th storage day.

Of the four changes of sensory characteristics, one change took place in the first half of preservation period and three changes in the second half. This suggests that the difference in the level of air temperature influences more the wine quality to the end of storage period.

CONCLUSIONS

Even if only one physicochemical characteristic changed due to increasing of preservation temperature with 5°C, the level of wine quality was not invariable during the 60 days preservation.

The most liable sensory characteristic to air temperature increase was the wine bouquet. Its level has decreased with 6.25% since the 30th day preservation and it has gone down to 16.66% in the 45th day preservation (2.6 times more than the initial level).

The wine taste is the only sensory characteristic which had the same evolution in preservation period on both 15°C and 20°C (in conditions of increasing the level of air temperature).

The correlation between physicochemical and sensory characteristics of Sauvignon Blanc wine is checked-up throughout the level of free sulphur dioxide and bouquet. Thus, the decrease of free sulphur dioxide level in the 30th and 45th day preservation (with 16.00% and 41.02%, respectively) had as result the decline of bouquet level (with 6.25% and 16.66%, respectively).

A comparison of changes of physicochemical and sensory characteristics shows that each of these had a particular evolution. In the 30th and 45th day preservation only one physicochemical characteristic and one sensory characteristic changed its level. Instead, in 60th day preservation one physicochemical characteristic and two sensory characteristic changed.

Since both physicochemical and sensory characteristic changed their level at 15°C and 20°C temperature, the level of wine quality decreased which means that the preservation methods are very important to maintain constant the foods quality from the moment of production until it is bought by consumers and has inferences on food safety.

There are at least three possibilities to extend the current research of Sauvignon Blanc wine presented in this paper. Firstly, the evolution of physicochemical and sensory characteristics of the wine preserved at a new temperature (maybe 10°C) can be tested. Secondly, it can be measured the evolution of wine quality level by changing the level of air temperature and relative air humidity in the same time. Thirdly, an additional testing in the 37th day preservation can be set up, since it is possible that some changes of sensory characteristics level will become visible quicker than 45th day preservation.

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